

REMARKS

Claims 2, 9, and 16 have been cancelled. Claims 1, 3-6, 8, 10-13 and 15 have been amended. Claim 1 has been amended to include the features of original claim 2. Claims 3-6 have been amended to depend from claim 1 rather than claim 2. Claim 8 has been amended to include the features of original claim 9. Claims 10-13 have been amended to depend from claim 8 rather than claim 9. Claim 15 has been amended to include, *inter alia*, the features of original claim 16. No new matter has been added. Upon entry of this Amendment, claims 1, 3-8, and 10-15 remain pending.

In the Office Action dated July 12, 2005, claims 8, 15, and 16 were rejected under 35 U.S.C. § 102(e) as being anticipated by Ahmad (U.S. Patent No. 6,881,971, hereinafter “Ahmad”). Applicants respectfully traverse this rejection.

Independent claim 8 recites an illumination system for providing a beam of radiation. The illumination system includes, *inter alia*, “a radiation-production system that produces extreme ultra-violet radiation...wherein the radiation-production system comprises two oppositely chargeable electrodes that generate an electric field therebetween, and the electric field substantially follows an axial direction of the radiation-production system.”

Ahmad discloses an EUV radiation source and a debris filter arrangement that includes various arrangements of electrodes. (Ahmad at col. 4, lns. 35-65; col. 5, lns. 2-10; col. 5, lns. 21-42; FIGs. 1-3.) In each embodiment, an electric field follows a direction that is substantially perpendicular to an axial direction of the radiation source. Ahmad does not disclose an illumination system that includes “two oppositely chargeable electrodes that generate an electric field therebetween, and the electric field substantially follows an axial direction of the radiation-production system,” as recited by claim 8.

Moreover, Ahmad does not suggest that the electrodes can be arranged to generate an electric field that substantially follows an axial direction of the radiation-production system. The electrodes of the debris filter arrangement of Ahmad are specifically arranged to generate an electric field that is oriented orthogonal to the central propagation direction of a divergent beam bundle exiting the radiation source. (Ahmad at col. 2, lns. 19-33, FIGs. 1, 2, 3.) Orienting the electrodes of Ahmad in a manner that would generate an electric field that substantially follows an axial direction of the radiation source would block the transmission of the radiation to the collector optics and thus significantly change the principle of operation of Ahmad.

Accordingly, Applicants respectfully submit that claim 8 is patentable over Ahmad, and respectfully request that the rejection to claim 8 be withdrawn.

Independent claim 15 recites a method for providing a beam of radiation that includes, *inter alia*, “generating an electric field along said particle-movement direction, wherein the electric field substantially follows an axial direction of the radiation-production system.” As discussed above, the electric field that is generated in the debris filter arrangement of Ahmad follows a direction that is orthogonal to an axial direction of the radiation source. Moreover, as discussed above, orienting the electrodes of Ahmad in a manner that would generate an electric field that substantially follows an axial direction of the radiation source would block the transmission of the radiation to the collector optics and thus significantly change the principle of operation of Ahmad. Thus, Ahmad does not disclose or suggest all of the features of claim 15.

Accordingly, Applicants respectfully submit that claim 15 is patentable over Ahmad and respectfully request that the rejection to claim 15 be withdrawn.

In the Office Action, claims 1, 2, 4-5, 7, 9, 11-12, and 14 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kandaka et al. (U.S. Patent No. 6,590,959, hereinafter “Kandaka”) in view of Ahmad.

Independent claim 1 recites a lithographic apparatus that includes, *inter alia*, an illumination system that provides a radiation beam. The illumination system includes, *inter alia*, a “radiation-collection system being arranged to collect extreme ultra-violet radiation which radiates in a collection-direction, the collection-direction being substantially different from the particle-movement direction, wherein the radiation-production system comprises two oppositely chargeable electrodes that generate an electric field therebetween, and the electric field substantially follows an axial direction of the radiation-production system.”

Kandaka discloses sources for producing short-wavelength electromagnetic radiation (EMR). (Kandaka at Abstract.) In each embodiment disclosed by Kandaka, a central electrode (21, 31, 41) is surrounded by a coaxial “hollow” electrode (22, 32, 42). (Kandaka at col. 7, lns. 2-4; col. 8, lns. 37-40; col. 9, lns. 4-6; FIGs. 1, 3, 4.) The potential applied across the electrodes results in the production of a plasma. (Kandaka at col. 7, lns. 32-36.) The electrodes do not generate an electric field that substantially follows an axial direction of the respective source. Moreover, as the Examiner has conceded, Kandaka does not disclose or suggest “a radiation collection system that collects the extreme ultraviolet radiation, the radiation collection system being arranged to collect extreme ultraviolet radiation which

radiates in a collection direction, the collection direction being substantially different from the particle movement direction.” (Office Action at p. 3.)

Ahmad is discussed above. Because Ahmad does not disclose or suggest a lithographic apparatus that includes, *inter alia*, a radiation-production system that includes “two oppositely chargeable electrodes that generate an electric field therebetween, and the electric field substantially follows an axial direction of the radiation-production system,” as recited by claim 1, the combination of Kanaka and Ahmad, does not disclose or suggest all of the features of claim 1, and a *prima facie* case of obviousness has not been made.

Accordingly, Applicants respectfully submit that claim 1, and the claims that depend therefrom are patentable over Kandaka in view of Ahmad, and respectfully request that the rejection to claims 1, 4, 5, and 7 be withdrawn.

Claim 9 has been cancelled, but its features are now included in claim 8. Claims 11, 12, and 14 depend from claim 8. As discussed above, claim 8 is patentable over Ahmad. Kandaka does not cure the deficiencies of Ahmad. Kandaka is discussed above. Kandaka does not disclose or suggest an illumination system that includes, *inter alia*, “a radiation-production system that produces extreme ultra-violet radiation... wherein the radiation-production system comprises two oppositely chargeable electrodes that generate an electric field therebetween, and the electric field substantially follows an axial direction of the radiation-production system,” as recited by claim 8. Because the combination of Kandaka and Ahmad does not disclose or suggest all of the features of independent claim 8, the combination does not disclose or suggest all of the features of dependent claims 11, 12, and 14.

Accordingly, Applicants respectfully submit that dependent claims 11, 12, and 14 are patentable over Kandaka in view of Ahmad and respectfully request that the rejection to claims 11, 12, and 14 be withdrawn.

In the Office Action, claims 1-3, 6, 9-10, 13, and 16 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kandaka in view of Klebanoff et al. (U.S. Patent No. 6,888,297, hereinafter “Klebanoff”). Applicants respectfully traverse this rejection.

Independent claim 1 and Kandaka are discussed above. As conceded by the Examiner, Kandaka does not disclose many of the features of claim 1. Klebanoff discloses an electrical capillary discharge source (100) with a front electrode (120) and a rear electrode (130). (Klebanoff at col. 3, lns. 24-42; FIG. 3.) The source also includes an endcone (150) that is disposed proximate the front electrode (120). (Klebanoff at col. 3, lns. 43-65; FOG. 3.) The

endcone (150) is maintained at a temperature that is either higher than or cooler than the front electrode (120) to create a thermophoretic force that will push debris particles away from the hotter region to the cooler region. (Klebanoff at col. 3, lns. 43-65.) Klebanoff does not specifically disclose a radiation-collector system. However, Klebanoff discloses that the endcone (150) comprises “a conical-shaped surface of rotation subtending an angle of about 20° to 30° from the axial line of capillary 115 in order to avoid blocking more than a small solid angle of the radiation emitted from the discharge source.” (Klebanoff at col. 3, lns. 43-48, emphasis added.) Although Klebanoff schematically shows the direction of propagation of the EUV to generally be at an angle relative to the axial line of the capillary (115), it is not clear where the collection optics are located relative to the discharge source (100), particularly in view of the aforementioned description of the endcone (150). Thus, Applicants respectfully submit that Klebanoff does not teach an illumination system that includes, *inter alia*, a “radiation-collection system being arranged to collect extreme ultra-violet radiation which radiates in a collection-direction, the collection-direction being substantially different from the particle-movement direction,” as asserted by the Examiner.

Moreover, there is no motivation to combine Klebanoff with Kandaka because the arrangement of the electrodes in the respective discharge sources are not compatible. Kandaka specifically states that “[t]he electrodes are configured and oriented such that, as the collimated beam passes by the electrodes, the electrodes exhibit minimal blocking of the EMR flux.” (Kandaka at Abstract.) Putting the capillary discharge source and endcone of Klebanoff in the apparatus of Kandaka would change the principle operation of Kandaka. As such, the teachings of Kandaka and Klebanoff “are not sufficient to render the claims *prima facie* obvious.” (MPEP §2143.01, citing *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959.)

Accordingly, Applicants respectfully submit that claim 1 and claims 3 and 6 that depend from claim 1 are patentable over Kandaka in view of Klebanoff and respectfully request that the rejection to claims 1, 3, and 6 be withdrawn.

Claim 9 has been cancelled, but its features are now included in claim 8. Claim 8, Kandaka, and Klebanoff are discussed above. As stated above, Applicants respectfully submit that Klebanoff does not teach an illumination system that includes, *inter alia*, a “radiation-collection system being arranged to collect extreme ultra-violet radiation which radiates in a collection-direction, the collection-direction being substantially different from the particle-movement direction,” as asserted by the Examiner. Moreover, there is no

motivation to combine Klebanoff with Kandaka because the arrangement of the electrodes in the respective discharge sources are not compatible, as discussed above.

Accordingly, Applicants respectfully submit that claim 8 and claims 10 and 13 that depend from claim 8 are patentable over Kandaka in view of Klebanoff and respectfully request that the rejection to claims 10 and 13 be withdrawn.

Claim 16 has been cancelled, but its features are now included in claim 15. Claim 15 recites a method for providing a beam of radiation that includes, *inter alia*, "collecting extreme ultra-violet radiation that radiates in a collection direction, said collection direction being substantially different from said particle-movement direction; and generating an electric field along said particle-movement direction, wherein the electric field substantially follows an axial direction of the radiation-production system."

As stated above, a *prima facie* case of obviousness cannot be made because putting the capillary discharge source and endcone of Klebanoff in the apparatus of Kandaka would change the principle operation of Kandaka. Moreover, because Klebanoff does not disclose or suggest a method for providing a beam of radiation that includes, *inter alia*, "collecting extreme ultra-violet radiation that radiates in a collection direction, said collection direction being substantially different from said particle-movement direction," the combination of Kandaka and Klebanoff do not disclose or suggest all of the features of claim 15.

Accordingly, Applicants respectfully submit that claim 15 is patentable over Kandaka in view of Klebaoff.

All rejections having been addressed, it is respectfully submitted that the present application is in a condition for allowance and a Notice to that effect is earnestly solicited. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, please contact the undersigned at the telephone number listed below.

Please charge any fees associated with the submission of this paper to Deposit Account Number 033975. The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,

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